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ABSTRACT

This module, written for middle school students in grades 5-8, is oriented toward informing students about environmental issues in relation to their own health and well-being. It is deliberately focused on a few issues that will interest young adolescents, and is not intended to be comprehensive. The six lessons stress individual action and include opportunities to assess current situations at school or at home. Lesson 1 introduces the goals of the curriculum and encourages students to share what they know about the environment. In lesson 2, students monitor their water use for a day and calculate the total number of gallons of water used by the class in one day. Lesson 3 continues the theme of personal responsibility with a student assignment to collect all personal garbage for a day. In lesson 4, students survey sources of air pollution at home or at school and commit to an action to help reduce air pollution. Lesson 5 broadens the focus from local aspects of environmental issues to global issues, with the introduction of rain forests as an important environmental resource. In lesson 6, students are encouraged to review the commitments they have made and assess their progress toward an environmental ethic. Student information and worksheets are included. (LLL)

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CONTEMPORARY HEALTH SERIES

Kathleen Middleton, MS, Series Editor

INTO ADOLESCENCE:

Caring for Our Planet and Our Health

INTO ADOLESCENCE:

Caring for Our Planet and Our Health

A Curriculum for Grades 5-8

Lisa K. Hunter, PhD

Contemporary Health Series
Kathleen Middleton, MS, Series Editor

Network Publications, a division of ETR Associates
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EDITOR'S PREFACE
Contemporary Health Series

Health educators and practitioners know that prevention of health problems is far more desirable than treatment. The earlier the knowledge and skill to make healthful decisions are instilled, the greater the chance a healthful lifestyle will be adopted. School is the logical place in our society to provide children, adolescents and young adults the learning opportunities essential to developing the knowledge and skills to choose a healthful life course.

The **Contemporary Health Series** has been designed to provide educators with the curricular tools necessary to challenge students to take personal responsibility for their health. The long-range goals for the **Contemporary Health Series** are as follows:

Cognitive. Students will recognize the function of the existing body of knowledge pertaining to health and family life education.
Affective. Students will experience personal growth in the development of a positive self-concept and the ability to interact with others.
Practice. Students will gain skill in acting on personal decisions about health-related life choices.

Within the **Contemporary Health Series** there are two curricular divisions: Into Adolescence for middle school teachers and Entering Adulthood for high school teachers. The Into Adolescence modules focus on several different health and family life topics. Modules addressing puberty, AIDS, the family, self-esteem, reproduction and birth, sexual abstinence, and drug, alcohol and tobacco education have been developed by skilled author/educators.

Entering Adulthood includes reproduction, birth and contraception, health behavior, communication and self-esteem, AIDS and other STDs, relationships, sexual abstinence, and drug, alcohol and tobacco education.

All the authors are, or have been, classroom teachers with particular expertise in each of the topic areas. They bring a unique combination of theory, content and practice resulting in curricula which weave educational learning theory into lessons appropriate for the developmental age of the student. The module format was chosen to facilitate flexibility as the modules are compatible with each other but may stand alone. Finally, ease of use by the classroom teacher has driven the design. The lessons are comprehensive, key components are clearly identified and masters for all student and teacher materials are provided.

The **Contemporary Health Series** is intended to help teachers address critical health issues in their classrooms. The beneficiaries are their students, our children, and the next generation.

Kathleen Middleton, MS, CHES
Series Editor

ACKNOWLEDGMENTS

I would like to thank the many organizations concerned with environmental issues across the country who so generously shared their resources with us in the development of this curriculum. They are so numerous that it would be impossible to list each of them here individually. One resource, however, was particularly useful in every lesson: *50 Simple Things Kids Can Do to Save the Earth*, by The EarthWorks Group, Berkeley, California.

I would also like to thank Marilyn Jensen, a teacher at Loma Vista School, Vallejo City Unified School District, California, for her thoughts on the content and sequencing of the lessons.

In addition, I appreciate the input of the people who reviewed *Into Adolescence: Caring for Our Planet and Our Health* and made thoughtful and constructive comments for its revision.

INTRODUCTION

Environmental issues hit the news almost every day—endangered species, oil spills, toxic waste, the hole in the ozone layer, destruction of the rain forests. Concern for the environment is often focused on our families, neighborhoods and regions, but the issues are played out globally.

A major goal for our time is that each individual understand that he or she can make a difference by taking an active role in protecting the planet from further destruction.

> Thinking at a global level is a useful and exciting intellectual activity, but no substitute for the work needed to solve practical problems at home. If we really want to contribute to the welfare of humankind and of our planet, the best place to start is in our own community, and its fields, rivers, marshes, coastlines, roads, and streets, as well as with its social problems (Rene Dubos, 1981, in Samuels, M. and Bennett, H. Z., *Well Body, Well Earth* [San Francisco: Sierra Club Books, 1983], 199).

Encouraging young adolescents to accept this individual responsibility is the purpose of this curriculum. Young people must respect the natural environment in which they live and understand that their well-being and that of the planet are intertwined. Youth who develop environmentally sound habits will become adults who create policies and practices that nurture the earth rather than exploiting its resources.

Through the collective efforts of individuals, it is possible to reverse this trend of natural

destruction, which had already begun in 1855, as described in this letter from Chief Sealth of the Lakota Sioux Duwamish Tribe of Washington state to President Franklin Pierce in 1855.

> Every part of the earth is sacred to my people. Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people. The white man...is a stranger who comes in the night and takes from the land whatever he needs. The earth is not his brother but his enemy and when he has conquered it, he moves on. ...All things share the same breath—the beasts, the trees, the man. ...What is man without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever befalls the earth befalls the sons of earth. ...The whites too shall pass—perhaps sooner than other tribes. Continue to contaminate your bed, and you will one night suffocate in your own waste. When the buffalo are slaughtered, the wild horses all tamed, the secret corners of the forest heavy with the scent of many men, and the view of the ripe hills blotted by talking wires, where is the thicket? Gone. Where is the eagle? Gone. And what is it to say good-bye to the swift pony and the hunt, the end of living and the beginning of survival (Ehrlich, A. H. and Ehrlich, P. R. *Earth* [New York: Franklin Watts, 1987], 161).

Into Adolescence: Caring for Our Planet and Our Health is oriented toward informing students about the global environmental crises we face, their implications for human health and what each of us can do to protect our planet.

Overview

Into Adolescence: Caring for Our Planet and Our Health is written for middle school students, grades 5-8, with two goals. The first is to enable students to study environmental issues in relation to their own health and well-being. The second is to motivate students to take personal responsibility for doing what they can to protect the environment in order to sustain life and to improve human health.

This module is not intended to be comprehensive. It does not cover all the pressing environmental issues we face in all their complexity. The module is deliberately focused on a few issues that will interest young adolescents. They are issues where students can make a difference, as well as issues that lend themselves to enjoyable activities. Our hope is that students will begin to be aware of environmental issues and initiate lifelong habits of protecting the earth.

The link between environmental issues and personal health is often obvious, as in the case of air pollution leading to respiratory diseases or polluted drinking water leading to cancer. But sometimes the link will be less obvious to students.

For example, wasting water does not make one immediately ill, but the effect of ultimately running out of water would kill us all. Likewise, creating more garbage than can be disposed

of doesn't seem, on the face of it, to be related to health. What is in garbage—and how it's disposed of—*are* the health issues.

The second goal, that of feeling personal responsibility for the environment, must be tied to a sense of efficacy—that one's individual action will make a difference. Each lesson stresses the exponential growth of individual action and encourages students to examine what they can do on boht individual and group levels.

The lessons include opportunities to assess current situations at school or at home (how much garbage is created in one day, how much water is used, etc.). After investigation, students decide what individual action they can take to change the situation. Students also have options to take on class projects, for example, to reduce indoor air pollution at school.

The first lesson introduces the goals of the curriculum and the importance of individual action in caring for our planet and our health. Students study newspaper articles about current environmental issues and are encouraged to share what they know about the environment.

In Lesson 2, students monitor their water use for a day and figure the total gallons of water used by the class in one day. This figure is expanded to indicate water use in the larger community, so students can understand the importance of water conservation. The activities in this lesson encourage a personal commitment to actions that conserve water.

Lesson 3 continues the theme of personal responsibility for the environment with a student assignment to collect all personal garbage for a day. Class activities urge students to examine the links between their personal garbage, the environment and health. Students make a commitment to personal action to reduce the amount of garbage they generate.

The next lesson deals with air pollution. Students survey sources of air pollution at home or at school and commit to an action to help reduce air pollution.

Lesson 5 broadens the focus from local aspects of environmental issues to global issues. Students are introduced to the important environmental resource of rain forests. Once again, students commit to personal actions they can take that can help save rain forests.

For the final lesson, students are encouraged to review the commitments they've made during the module and assess their progress toward an environmental ethic. Students then create their own pictures of a healthy planet.

Encourage Personal Commitment

Throughout the lessons, students should be told to save the commitments they make to environmental actions. The worksheets with these commitments are titled **My Part in....** You may want to encourage students to keep a special notebook or a special section in their binders for these worksheets.

At the completion of the module, these worksheets will provide students a record of their goals for environmental action. Encourage students to keep the worksheets as a reference even after the module is completed. These commitments can remind students of the importance of individual action in caring for our planet and our health.

If you have a science background, or can team-teach with someone who does, *Caring for Our Planet and Our Health* could be expanded to cover the issues of acid rain, ozone depletion and the greenhouse effect in more detail. Be sure to emphasize students' ability to have an effect on these seemingly overwhelming problems.

Objectives

Lesson 1	*Caring for Planet Earth*	■ Students will be able to define important environmental terms.
Lesson 2	*The Water We Need*	■ Students will be able to list three ways in which water is important to the life of human beings and to the earth. ■ Students will be able to describe ways they can personally conserve water.
Lesson 3	*Too Much Garbage*	■ Students will be able to list three ways to manage garbage. ■ Students will be able to describe ways in which they can reduce the amount of garbage at school or at home.
Lesson 4	*Clean Air, Please*	■ Students will be able to describe sources of indoor and outdoor air pollution. ■ Students will be able to describe some health consequences of air pollution. ■ Students will be able to identify action steps to reduce or prevent indoor air pollution at home or at school.
Lesson 5	*Save the Rain Forests*	■ Students will be able to explain why rain forests are important to human beings around the world.

- Students will be able to identify consequences of the destruction of rain forests.
- Students will be able to identify personal actions to help save the rain forests.

Lesson 6 *Protecting Our Planet*

- Students will be able to identify ways they can help care for the environment.

Time

The time indicated for each lesson is an approximate measure, based on a 45-50 minute class period. The actual time required to complete all activities in a given lesson will vary, depending on student interest and ability. Lessons that will probably require more than one class period to complete are indicated.

Instructional Strategies

Throughout this module, students explore environmental issues in their own lives, and pledge through self-contracts to take action to create change. Students should be encouraged to collect these pledges and review their efforts periodically.

The module incorporates a variety of instructional strategies to develop and maintain student motivation and interest at peak levels. Some of the strategies are traditional, while others are more interactive, encouraging students to help each other learn. The specific strategies used in each lesson are clearly identified. An alphabetical list of instructional strategies and their descriptions follow:

Brainstorming
Class Discussion
Cooperative Learning Groups
Creative Expression
Overhead Transparencies
Teacher Lecture
Worksheets

Brainstorming

Brainstorming is used to stimulate discussion of an issue or topic. Students are asked to give their ideas and opinions without comment or judgment from the teacher or other students. Ideas can be listed on the chalkboard, on butcher paper or newsprint, or on a transparency. Brainstorming should continue until all ideas have been exhausted or a predetermined time limit has been reached.

Class Discussion

A class discussion led by the teacher is one of the most valuable strategies used in education. It can be used to initiate, amplify or summarize a lesson. Most of the lessons in this module include some form of class discussion.

Cooperative Learning Groups

Cooperative learning is one of the most common and effective strategies used in this module. Students work in small groups to disseminate and share information, analyze ideas or solve problems. The size of the group depends on the nature of the lesson and the make-up of the class. Groups work best with two to six members.

Group structure will affect the success of the lessons. Groups can be formed by student choice, random selection or a more formal, teacher-influenced process. Groups seem to function best when they represent the variety and balance found in the classroom. Groups also work better when each student has a responsibility within the group (reader, recorder, timer, reporter, etc.).

While groups are working on their tasks, the teacher should move from group to group, answering questions and dealing with any problems that arise. At the conclusion of the group process, some closure should take place.

Creative Expression

Asking students to write short stories or poems or make drawings or collages about topics they are studying integrates language arts, fine arts and personal experience into a lesson. This technique can be used as a follow-up to most lessons.

Overhead Transparencies

Overhead transparencies are an effective visual aid to use in presenting information and graphic examples. Most of the lessons in this module provide teacher resources that can be used as transparencies.

Teacher Lecture

A traditional teacher lecture disseminates information directly from the teacher to students. In some lessons, this approach is the best way to provide information. Generally, this method is combined with other methods to assure high-level motivation and learning.

Worksheets

Most lessons in this module include worksheets. Students may be asked to complete the worksheets individually or in cooperative learning groups. Some worksheets include an activity to be completed outside of class. Completed worksheets should generally be reviewed with the whole class to provide relevant and timely feedback.

Make It Real

The natural environment is a critical and dynamic part of our social and political world. There are individuals at all levels within your community who are concerned about environmental issues. You can make this unit more real to students by inviting guest speakers to visit your class and share their experiences and concerns. Again, such local visitors can help make global issues more relevant by explaining the link to the local situation. See the Resources list of

environmental organizations in the appendix for suggestions of people to contact.

There are also many films, videos and other audiovisual aids that can help you make environmental problems exciting and dramatic issues to discuss. Check with your district's media library for resources.

Field trips are another way to make the environment become real. You could visit the garbage dump, recycling centers, local wilderness area or nearest power plant to investigate various environmental issues.

There are also many local, national and international service opportunities in environmental protection in which you may want to involve your class. These range from adopting a stream to protect it from pollution to buying trees to replant tropical rain forests.

Finally, you can make the action steps recommended to students more real if you institute some of them in your classroom. For example, you may want to establish a recycling bin for paper or aluminum cans.

Teacher Responsibilities

Modeling is as important in teaching environmental responsibility as it is in every other health education issue. If you show your students by your personal actions that you believe environmental protection is worth the effort, they will follow in your footsteps.

Consider ways to actively practice conservation efforts in your classroom or school. For example, you may choose to start a recycling bin in the classroom or on campus for paper or aluminum cans; your class may work with the custodians to add water-saving devices to school toilets; you may choose to ride your bike to school or organize teacher car pools; and so on.

The environment is always in the news, whether the issue is local environmental hazards, national environmental politics or international cooperation or debates. While the lesson plans provided in this module include enough information to stand alone, learning can be significantly enhanced by use of the local newspaper as a supplementary text.

Once you get started, you will no doubt find many other ways to use local resources, including the newspaper, library or municipal planning commission, etc. Each can help students to realize that environmental issues are not out there in some ivory-tower way, but rather are real issues affecting each individual.

As a way to keep environmental issues visible in the classroom, you may wish to create a special class bulletin board, and post recent newspaper articles about local issues. There are also a number of free or low-cost posters and materials available that you can use in creating a class bulletin board. Groups that offer these are listed under "Resources" at the end of the module.

Finally, take advantage of environmental observances, if convenient. April 22 is Earth Day each year. By planning your environmental unit around this event, you can make the issue come alive for students when they see a community-wide relevance to what they are learning in school. Other observances to consider are U.N. Environment Day on June 5, World Population Week and World Wildlife Week in October.

Evaluative Methods

Each lesson provides the teacher with one or more methods for evaluating student performance on stated objectives. The methods are listed following the procedure section of each lesson. Evaluative methods include analysis and comment on worksheets and other written materials, as well as observation of individual responses.

It is impossible to objectively, quantitatively or qualitatively measure the development and maintenance of personal behaviors that affect the environment, and it is inappropriate to grade student work that is reflective of individual feelings, beliefs or behaviors. Therefore, the evaluation methods serve as tools to assess students' participation and cognitive learning from each lesson.

Follow-Up/Extension Activities

Follow-up/extension activities are included in most of the lessons in this module. These activities provide additional learning opportunities and may serve as a link between school and home.

LESSON 1

CARING FOR PLANET EARTH

Objective

Students will be able to define important environmental terms.

Time

One or two class periods.

Overview

This lesson introduces the goals of the curriculum and gives students an opportunity to share what they know about the environment and environmental problems.

Students study newspaper articles for specific and current examples of environmental issues. The importance of individual, local action in caring for our planet and our health is also introduced.

Instructional Strategies

Brainstorming, class discussion, cooperative learning groups, worksheets.

Teacher Materials and Preparation

ASSIGN:

✓ Students to collect articles related to environmental issues from local newspapers, or collect the articles yourself for students to study in small groups.

HAVE:

✓ Overhead projector.
✓ Chalk and chalkboard.

COPY:

✓ **Vocabulary for Planet Earth** worksheet, one for each student.

PREPARE:

✓ Post in the classroom or have available pictures of beautiful natural settings and other pictures showing environmental destruction.

MAKE:

✓ Transparency of **Planet Earth**.

REVIEW:

✓ **Creating a Healthy Environment** ***Teacher Background Information.***

Procedure

■ Show students the **Planet Earth** transparency, and read the quotation. Tell students they are going to begin a study about the environment of our planet. They will learn how taking care of the environment—the earth—will help keep human beings and all other living things healthy. Students will also learn what they can do to help take care of our planet.

Ask students what comes to their minds when they think of the earth. What is the earth made of? (air, land, water) What lives on the earth? (human beings, animals, plants) What do living things

need in order to survive? (air, food, water)

Introduce the term *biosphere*. Tell students the earth is covered with a thin film of air, soil and water called the biosphere. The biosphere is like a coat of paint on a football, and we all share it. Another term for the biosphere is the *natural environment*.

■ Ask students if they know the word *environment*. What have they heard about the environment? Write student responses on the board. Guide students to develop a class definition of environment. One definition of environment is:

> *The natural world around us—made up of the air we breathe, the water we drink, the land we walk on—and all the other species on earth.*

■ Introduce the term *pollution*. Define pollution as making the environment dirty or sick, especially with human-made waste. Ask students to brainstorm some examples of pollution.

Show students the pictures of beautiful environments, and compare to those that have been polluted or destroyed. Ask students what they think happened to cause the pollution or destruction.

■ Tell students they will be learning about different environmental problems. Ask them to brainstorm some of the problems that might be related to air, to water and to land. Write student responses on the board.

■ Write AIR, LAND and WATER in three columns across the board. Divide the class into small groups, and give each group one or two newspaper articles about environmental issues. Have one group member read the article (or parts of the article) aloud. Students should then discuss the issues with their groups and decide whether each problem relates to air, land or water.

Ask groups to briefly report to the class on their issues. As groups report, list each environmental issue on the board under the appropriate category—air, land or water.

Ask students to think about how these issues relate to their lives. Tell students that in this module, they'll be learning about problems of wasting water, creating too much garbage, polluting the air and destroying forests.

Tell students they will first gather information about the problems and how to solve them. Then students will pledge certain actions to help care for our planet, our environment and our health.

Tell students they have another important role in helping the environment. After they take an action themselves, they can then convince another person—a friend, a parent, or someone else in their families—to take action as well. In this way, many people will be working together to make changes—changes that will help us take better care of our planet and our health.

Evaluation

Distribute the **Vocabulary for Planet Earth** worksheet, and have students write in the definitions. Assess students' responses for their ability to define environmental terms.

Follow-Up/ Extension

Have students make posters with the words from the **Vocabulary for Planet Earth** worksheet and their definitions. Post them around the room for the duration of this module.

Creating a Healthy Environment

Teacher Background Information

> Planet Earth condensed 4,600 million years ago from hot gases and cosmic dust. It cooled into a beautiful blue orb, slightly squashed at one pole but still easy to fall in love with. Barring accidents, like the sun going out, it will be here for another 10,000 million years.... In this corner of the universe, Earth is the only planet that can support life. It's covered with a thin film of air, soil and water called the biosphere. In size it's like a coat of paint on a football and it weighs one-billionth of the planet. We all live in it. (Croall, S. and Rankin, W., *Ecology for Beginners* [New York: Pantheon Books, 1981], 6-8)

The environment is the natural world around us, made up of the air we breathe, the water we drink, the land we walk and all the other species on earth. Today, our environment is threatened to a critical degree. The issues relating to acid rain, global warming, ozone depletion or toxic waste make headlines daily.

Ecology is the study of how living organisms relate to their environment. The ecosystem is the complex web linking animals, plants, air, water and every other life form in the biosphere. Any change in one part of the ecosystem affects many other parts. The interrelationships and interdependence of the parts of our environment have led to the serious condition of the earth.

These components of the environment are each vital to life itself and interrelated. Pollutants in the air fall to the earth and settle into the water. Garbage in landfills decomposes, and toxic chemicals leak into the earth nearby. Foods grown in polluted ground or sprayed with pesticides may cause cancer or other serious illnesses.

In general, the natural environment is made up of three components: land, air and water. Each of these components is vital to life itself. On the land, we grow the food that keeps us alive. The air we breathe provides oxygen for our lungs to work. Our bodies are 60 percent water. Without healthy food, clean air and pure water, we would quickly die.

So, even though it is convenient to talk about land, air and water separately, it is important to remember that they work together as part of a larger system. In fact, the earth itself is one giant system, where national boundaries hold no meaning. Thus, when one part of the world's environment is threatened, all other parts are also threatened.

Among our most pressing environmental concerns are:

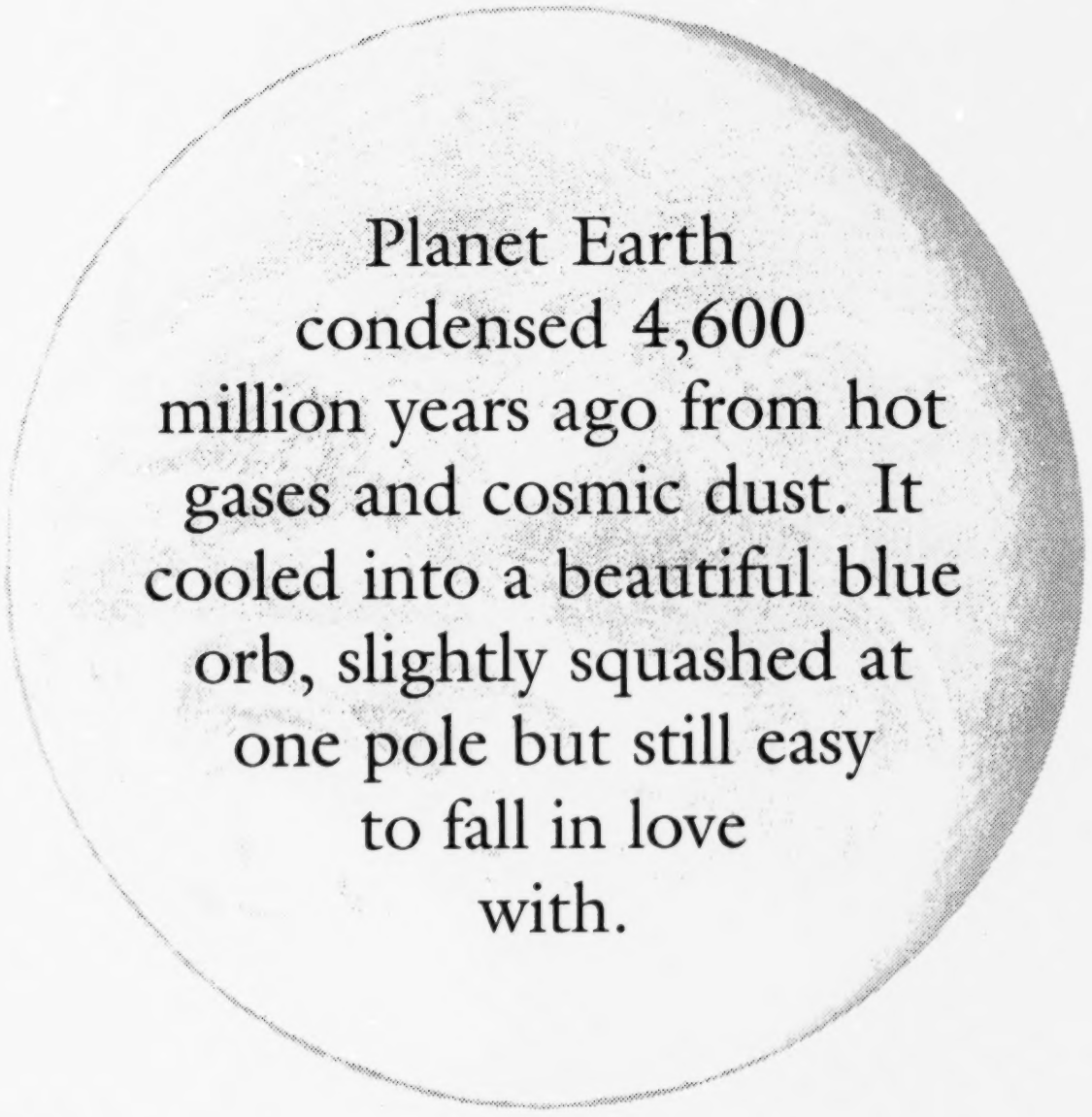
↔ A ***global warming*** trend, caused by an unprecedented increase in carbon dioxide in the atmosphere. This increase, a result of fuel emissions, is aided by the destruction of tropical rain forests, which absorb carbon dioxide. This rise in global temperatures is also known as the *greenhouse effect*. Scientists predict it will cause major changes on earth. In some areas, decreased rainfall could cause crops to fail and deserts to expand. In other areas, increased rainfall could raise sea levels, flooding coastal areas. The changes could lead to mass extinction of plants and animals.

↔ ***Ozone depletion,*** a thinning of the ozone layer in the stratosphere that protects us from the harmful ultraviolet rays of the sun. This thinning is caused primarily by the use of chlorofluorocarbons (CFCs) and halons.

CFCs are used as cooling agents in refrigerators and air conditioners, as propellants for aerosol sprays, as blowing agents for foam insulation and as cleaning agents in electronics manufacturing. They are also used in the production of polystyrene (Styrofoam). Halons are used in fire suppression systems.

↔ An excess of ***garbage*** is overflowing available landfill space. Many materials, like plastics, do not decompose in landfills. Or when they do, they create toxins that seep into nearby ground water, poisoning the environment and posing potential health hazards to humans.

Planet Earth



STUDENT

Vocabulary for Planet Earth

Directions: Write a definition of the following words. Use the information discussed in class or look up the words in a dictionary.

1. environment

2. biosphere

3. pollution

LESSON
2

THE WATER WE NEED

Objectives

Students will be able to list three ways in which water is important to the life of human beings and to the earth.

Students will be able to describe ways they can personally conserve water.

Time

Two class periods.

Overview

When students understand the impact of human beings' use of water, they are better able to see the importance of conservation. To begin this lesson, students monitor their water use for a full day. They then figure the total number of gallons of water they have used. Total water use for the class is calculated from these figures.

The impact of our water use becomes obvious when the class's total water use is expanded to the school and the community.

Students also discuss the importance of water to health. Students make a commitment to conserve water and suggest ways to encourage others to conserve also.

Instructional Strategies

Brainstorming, class discussion, worksheets.

Teacher Materials and Preparation

HAVE:

✓ Overhead projector.
✓ Transparency marker.

COPY:

✓ **One Day of Water Use** worksheet, one for each student.
✓ **Tips for Saving Water** worksheet, one for each student.
✓ **My Part in Water Conservation** worksheet, one for each student.
✓ **Wasting Water** experiments, copies of each of four experiments to distribute to student volunteers or to as many students as you choose (optional).

MAKE:

✓ Transparency of **One Day of Water Use *Example***.
✓ Transparency of **One Day of Water Use** worksheet (blank).

REVIEW:

✓ **The Water We Need *Teacher Background Information***.

Procedure

■ Begin a class discussion of the importance of water to living things—human beings, animals, plants. Use ***Teacher Background Information*** as a guide for this discussion.

■ Distribute the **One Day of Water Use** worksheet. Tell students they will be keeping track of all the water they use for a 24-hour period—at school, home or anywhere else—by tallying each type of use. *Note:* Handle this assignment with sensitivity, as some

students could be embarrassed about certain items on the worksheet. Assure students that information about personal habits will be kept confidential. Tell students ***not*** to write their names on the worksheets.

■ Show students the **One Day of Water Use *Example*** transparency, and explain the assignment. Each time they use water, students should make a tally mark in the *Times* column of the worksheet next to that type of water use.

When students have charted their water use for 24 hours, they should calculate their total water use for each activity. Tell students to multiply the number of tallies they marked for each use by the number of gallons in the middle column. The result will indicate the total number of gallons of water they used in each category.

Students should then add the number of gallons they used in each category to find their total water use for the 24 hours. Ask if there are any questions about the worksheet. Tell students to bring the completed worksheet to the next class. Stress that the worksheets are *anonymous;* students should ***not*** write their names on them.

■ When students have completed the **One Day of Water Use** assignment, have them turn in the completed, unsigned worksheet. Ask one or two students to quickly tally all the worksheets to obtain classroom totals for each type of water use. Have these students fill in a blank transparency of the **One Day of Water Use** worksheet with the class totals for each type of use.

Show the class the filled-in transparency, and add up the total gallons used by the class. Mark this number on the transparency.

Multiply that number by the number of students in the school, then by the number of people in your town or city, etc. Ask students, "Is it possible for human beings to use up all the water there is on Planet Earth?"

■ Discuss the importance of water conservation, using the following questions to guide the discussion:

- Imagine a day without water. What would that be like?
- How much of the water you used in a day was wasted water, like letting water run while you brushed your teeth?
- What is water conservation, and why is it important?

- What is the relationship between water conservation and your health?

■ Distribute the **Tips for Saving Water** worksheet. Have students read the suggestions, then brainstorm more ideas to add to the list of tips.

Ask students to brainstorm some ways to change the water-use habits of their friends and families. How could they convince other people to conserve?

■ *Optional:* Suggest that students do some research on how much water is wasted in homes. Review the four **Wasting Water** experiments with students, and ask for volunteers to conduct each experiment. Ask students to report their findings to the class at a later session.

(These experiments were adapted from *50 Simple Things Kids Can Do to Save the Earth,* published by the EarthWorks Press, Berkeley, CA. Copyright 1990.)

■ Distribute the **My Part in Water Conservation** worksheet. Have students complete it in class or as homework.

Evaluation

Ask students to list (in class or as homework) three reasons water is important to us and one way in which conserving water relates to our health.

Assess students' responses on the **My Part in Water Conservation** worksheet for their knowledge of water conservation techniques.

The Water We Need

Teacher Background Information

Why is water important to us?

About two-thirds of our bodies is water. Water covers three-quarters of the earth's surface. Water is essential to maintaining life; it is the basic source of all hydrogen and oxygen, the chemical foundation of all energy and life.

Not only is water necessary to us to live. We also use it to bathe and swim in, and to cook, clean dishes and wash clothing. Water is used for energy and transportation. Many, many creatures live in water. Without their watery habitats, these creatures would die.

What is water conservation and why is it important?

Water conservation means *careful* use of the water we need for our survival, whether it be water for drinking or water in rivers, oceans and lakes that sustains other life forms. Every time we turn on the faucet, fresh water flows out from reserves in the ground and from rivers and streams.

In the Middle Ages, most people probably used about 3 to 5 gallons of water a day. In the 1800s, that amount jumped to about 95 gallons a day in the West. Today, in the United States, water use for recreation, cooling, food production and industrial supply equals about 1,500 gallons a day per person. However, each of us *could* live on a gallon or so of water a day for drinking, cooking and washing—although we seldom do.

Conserving water saves energy and preserves fresh-water habitats. So much water is already diverted from rivers and lakes to meet the demands of farming, industry and personal water use. This diversion is particularly necessary in areas of the country where there is an insufficient water supply, such as the Southwest.

Water diversion often leads to the destruction of wildlife. When rivers shrink, fish can no longer follow their normal paths of migration to spawn and may fail to reproduce. Diminishing water also destroys animal habitats in wetlands.

When ground water is the source of our water supply and is used faster than it is replenished, it can cause land to sink, a process called subsidence. Once subsidence occurs, the underground aquifers where water is stored cannot be reformed. According to the U.S. Geological Survey, 35 states are pumping ground water faster than it is being replenished.

How can we conserve water?

Individuals can make a difference in solving the problems of water waste. By conserving water in the home, the average household can save more than 30,000 gallons of water per year.

STUDENT

One Day of Water Use

Directions: Keep a record of how much water you use in one day. From the time you get up in the morning until you go to bed at night, put a tally mark next to each type of water use every time you do it.

Then count the tallies for each type of water use. Multiply the number of times for each use by the number of gallons indicated in the center column. Write the total gallons for each use in the right-hand column. Then add this column to find the total number of gallons of water you used in one day.

Bring the completed worksheet to class to turn in. No name, please. The information is all that is needed.

Type of water use	Times	Gallons each time	Total gals.
1. Take a shower		30 gal.	
2. Take a bath		36 gal.	
3. Brush teeth, tap running		5 gal.	
4. Flush toilet		6 gal.	
5. Wash hands, tap running		2 gal.	
6. Use dishwasher		16 gal.	
7. Use washing machine		60 gal.	
8. Wash car		10 gal. per min.	
9. Water yard or garden		12 gal. per min.	
10. Get a drink of water, tap running		1 gal. (includes washing glass)	
11. Prepare and cook food		2 gal.	

Total gallons used in one day _____

TEACHER

One Day of Water Use

Example

Directions: Keep a record of how much water you use in one day. From the time you get up in the morning until you go to bed at night, put a tally mark next to each type of water use every time you do it.

Then count the tallies for each type of water use. Multiply the number of times for each use by the number of gallons indicated in the center column. Write the total gallons for each use in the right-hand column. Then add this column to find the total number of gallons of water you used in one day.

Bring the completed worksheet to class to turn in. No name, please. The information is all that is needed.

Type of water use	Times	Gallons each time	Total gals.
1. Take a shower	/	30 gal.	*30*
2. Take a bath		36 gal.	
3. Brush teeth, tap running	//	5 gal.	*10*
4. Flush toilet	𝍸 ///	6 gal.	*48*
5. Wash hands, tap running	𝍸 𝍸	2 gal.	*20*
6. Use dishwasher	/	16 gal.	*16*
7. Use washing machine		60 gal.	
8. Wash car		10 gal. per min.	
9. Water yard or garden		12 gal. per min.	
10. Get a drink of water, tap running	𝍸 /	1 gal. (includes washing glass)	*6*
11. Prepare and cook food	/	2 gal.	*2*

Total gallons used in one day *132*

STUDENT

Tips for Saving Water

- Don't let the water run while you're brushing your teeth or washing your face or hands. Wet your toothbrush, washcloth or hands. Then turn off the water while you scrub. Turn the water back on to rinse.
- Convince your family or the school administration to put something in the toilet tank to save water when the toilet is flushed. You can buy a water displacement device or use a plastic bottle filled with water. Don't flush the toilet each time you use it.
- Take a shower instead of a bath. A shower can use about one-third as much water as a bath if you have a low-flow shower head and keep the shower short. Cut down the amount of time you spend in the shower, and don't turn on the water full-blast.
- Ask about installing a low-flow shower head in your shower.
- Check faucets, toilets and pipes for leaks. One small leak can waste 20 gallons of water a day. A leaky toilet can waste as much as 100 gallons of water a day!
- Don't let the water run to cool the water when you're thirsty. Keep a bottle of water in the refrigerator for a cool, refreshing drink.
- If you have a yard, ask your family to water the garden or grass only when it needs it. Water in the early evening, so the hot sun doesn't evaporate the water.
- If you wash a car, turn the water off when you're not using it. You can put a turn-off nozzle on the hose.
- Don't run a washing machine or a dishwasher unless there is a full load. Use the energy-saving or short cycle switch on the machines if they have it.
- Save the water that runs while you wait for hot water to start, and water plants with it.
- Use a bowl filled with water to wash vegetables rather than running the water; then water plants with it.
- Can you think of other ways to save water?

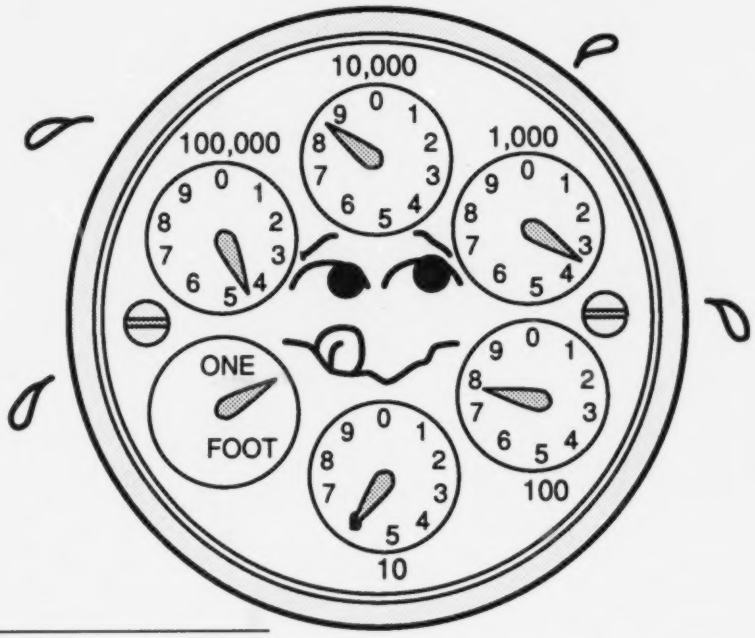
STUDENT

Wasting Water
Experiment 1– Meter Reader

Directions: One way to check for water leaks in toilets, sinks and pipes in a building or house is to check the water meter. Get someone to show you where the water meter is and how to read it.

Pick a time when no one will be using any water in the building. This should be a time when everyone is gone and no water is being used to run dishwashers or washing machines or water the yard.

Read the water meter before you leave, and write the number on the first line. Read the meter again when you return. Write that number on the second line. Compare the two numbers. If the numbers have changed, that means there's probably a leak somewhere in the building.



1. _____
   First reading
2. _____
   Second reading

3. Do the numbers indicate that there is a leak?

STUDENT

Wasting Water

Experiment 2– Leak Detective

Directions: A leaky toilet is one of the biggest water wasters. To check a toilet, take off the toilet tank cover and put about 12 drops of red or blue food coloring in the tank. Wait about 15 minutes. (Be sure no one uses the toilet while you're waiting.) If colored water shows up in the toilet bowl, there's a leak.

1. Did the water change color to indicate a leak?

2. How long did the experiment take?

STUDENT

Wasting Water
Experiment 3 – Down the Drain

Directions: This experiment will demonstrate how much water is wasted when it's left running while no one is using it. Did you know that while you're waiting for water to get cold enough to have a drink, you could fill six half-gallon milk cartons? How long do you think it would take to fill a milk carton with water?

Get an empty half-gallon milk container, and have a watch or clock ready. Turn on the water, and time how long it takes to fill the milk carton. Write the time on the first line, then answer the rest of the questions. Try to find a use for the water in the milk carton (water plants, etc.).

1. How long did it take to fill one milk carton?

2. How many gallons would be wasted in one day if you let the water run?

3. How many gallons would be wasted if everyone in your family was letting it run?

4. How many gallons would be wasted if everyone in your class let it run?

5. What did you do with the water in the container?

STUDENT

Wasting Water

Experiment 4 – Shower Check

Directions: Here's an experiment to see whether a shower head is using too much water. Get an empty half-gallon milk container and open it all the way up. Get someone to time you with a clock or a watch with a second hand.

Turn on the shower to a normal flow, and put the container under the shower head. If the carton overflows in less than 10 seconds, the shower head uses too much water. Ask about installing a low-flow shower head. Try to find a use for the water in the container (water plants, etc.).

1. How long did it take the carton to overflow?

2. Does the shower use too much water?

3. What did you do with the water in the container?

STUDENT

My Part in Water Conservation

Directions: Answer the following questions:

1. How could you save water at home?

2. How could you convince others in your family to help save water?

3. Choose two things you can do to save water. Fill in and sign this pledge for water conservation.

LESSON
3

TOO MUCH GARBAGE!

Objectives

Students will be able to list three ways to manage garbage.

Students will be able to describe ways in which they can reduce the amount of garbage at school or at home.

Time

Two class periods (with homework assigned before class).

Overview

This lesson begins with an assignment for students to collect all their personal garbage over a 24-hour period and bring it to class. Class time is spent calculating the amount of garbage produced by each student and by the class. A discussion of the amount of garbage Americans produce follows. Students are asked to make a commitment to one action to reduce the amount of garbage they generate.

Instructional Strategies

Class discussion, worksheets.

Teacher Materials and Preparation

ASSIGN:

✓ Students to collect all personal garbage for 24 hours in a paper or plastic bag.

HAVE:

✓ Overhead projector.
✓ A scale on which to weigh each bag of garbage.
✓ Large garbage cans to collect student garbage, with a sign for each.

COPY:

✓ **One Day's Garbage** worksheet, one for each student.
✓ **Three Rs for Garbage** worksheet, one for each student.
✓ **School Garbage** worksheet, one for each team of four or five students (optional).
✓ **My Part in Managing Garbage** worksheet, one for each student.

MAKE:

✓ Transparency of **Three Rs for Garbage**.

REVIEW:

✓ **Too Much Garbage!** ***Teacher Background Information.***

Procedure

■ In preparation for this lesson, ask each student to place all of his or her personal garbage over a 24-hour period in a bag. Tell students to carry the bag with them at all times, so *all* garbage is collected (including trash and garbage at school, at home, at a fast-food restaurant, etc.).

Suggest that students use a large paper bag to collect the garbage. However, tell students that if the bag becomes too messy or begins to smell, they can switch to a plastic bag.

Note: For cleanliness purposes, have students keep all wet or messy garbage in a separate bag (or double bag). This will make the sorting easier to do in class. Tell students not to bring anything to class that could pose a health risk to themselves or others. You may want to limit the collection to paper, bottles, cans and food containers. And, clear this activity with school administration *before* conducting the lesson.

■ Distribute the **One Day's Garbage** worksheet. Have students bring their garbage to class and complete the worksheet either as homework or at the beginning of class.

In class, weigh each bag of garbage. Compute how much garbage each student would create during one year and how much garbage the class would create during one year. Have students sort the garbage into trash cans labeled with the worksheet's categories—paper, food containers and other packages, cans, bottles, food scraps, other.

Ask students for their reactions to the garbage collection task. Discuss the following questions:

- What kind of garbage did you create the most of?
- About how much of your garbage will decompose within the next six months?
- How much of each kind of garbage did the class collect?
- How much did all the garbage for the whole class weigh?
- How much space does all the garbage take up?

■ Use ***Teacher Background Information*** as a basis for a mini-lecture about the importance of reducing the amount of garbage we create. Ask students what happens to garbage after it's put in a garbage can.

Emphasize that there is no such place as *away* to throw things. Explain the problems of landfills, incineration and ground water pollution.

Ask students to think about the relationship between garbage and our health, as well as the health of our planet. (The health link relates to how garbage is disposed of, whether it pollutes the air or the ground water.)

■ Ask students what *the three Rs* of managing garbage could be. Then distribute the **Three Rs for Garbage** worksheet. Show

students a transparency of the worksheet, and review the worksheet with them.

■ Distribute the **My Part in Managing Garbage** worksheet. Tell students to identify at least one action step they will take to reduce the garbage crisis at school or at home.

■ *Optional:* Create teams of four or five students each to investigate areas of the school to determine what is thrown away in the school in one day. For example, one team could handle classroom waste baskets; another, outside trash cans; another, cafeteria waste; another, janitorial waste; etc.

If possible, have teams conduct their investigation at the end of the school day. Each team should enter on the **School Garbage** worksheet how much (measured either by weight or by volume) paper, cans, bottles and food are thrown away. Teams should be prepared to report their findings to the class at another session.

Evaluation

Assess student responses on the **My Part in Managing Garbage** worksheet for students' understanding of the magnitude of the problem and their ability to list ways to manage garbage and describe ways they can help.

Follow-Up/ Extension

Based on the investigation of the school's garbage, students might want to take action to cut back on some of this garbage, such as starting a school recycling program for paper, glass and cans. You will need large boxes or bins to collect glass, metal and paper and a place to put them.

Each box should have a sign telling what kind of material goes into it and a reminder to take the tops off jars and bottles. Then you need a way to get the boxes to a recycling center or arrange for curb-side pickup if your community has that service. Make posters and announcements to let everyone at school know about your recycling program.

If your community does not have convenient means for recycling, make it a project to write to city government and/or local service groups to lobby for recycling centers and regular curb-side pickup.

Have students create posters to convince other students to recycle, and put them up around the school.

Visit a landfill, a recycling center or a recycling plant, if there is one near your school.

Too Much Garbage!

Teacher Background Information

Some facts about garbage.
Americans collectively throw out 160 million tons of garbage each year—that's enough to spread 30 stories high over 1,000 football fields. The average American family tosses out 6.73 garbage bags a week, 29 bags in a month or 350 bags in one year. That's 2,275 gallons annually.

We throw away enough glass bottles and jars to fill the 1,350-foot twin towers of New York's World Trade Center every two weeks. For every Sunday, it takes more than 500,000 trees to produce the 88 percent of newspapers that are never recycled. Americans go through 2.5 million plastic bottles every hour, only a small percentage of which are now recycled.

Every year we dispose of 24 million tons of leaves and grass clippings. We throw away enough iron and steel to continuously supply all the nation's automakers, and enough aluminum to rebuild our entire commercial airfleet every three months.

The problem is, not only are we running out of resources to make the products we need, we're running out of places to put what's left over.

Where does garbage go after it's thrown in the garbage can?
The answer is that there really is no place for all the garbage to go. Most of it goes from the garbage can to the garbage truck to landfills. However, more than two-thirds of the nation's landfills have closed since the late 1970s. One-third of the remaining landfills will be closed by the mid-1990s. As landfills close, many communities are trucking their trash across state lines and into rural areas.

One impact of poorly designed landfills is ground water pollution. When toxic wastes (i.e., from discarded batteries, medicines, paint, nail polish remover, household cleaners) are disposed of in household garbage, they get into ground water. In the United States, more than one-half of the population drinks ground water. If everyone stops throwing this kind of waste in the garbage or down the drain, it can help our drinking water stay fresh and clean.

Some waste is incinerated, but all but highly sophisticated and expensive incinerators release toxic air pollutants, including dioxins. Even the leftover ash from incinerators can be toxic.

There is no such thing as throwing garbage *away*—there is no away.

STUDENT

One Day's Garbage

Directions: Collect all your trash and garbage during one 24-hour period. On this worksheet, estimate the amount of garbage in your bag in the following categories. Write the numbers on the garbage cans for the different kinds of garbage.

1. *Count* the number of:
   - ➜ cans
   - ➜ bottles
   - ➜ pieces of paper.
2. *Count* the number of food containers or other packaging.
3. *Weigh* the food scraps, or measure the space the scraps take up.

STUDENT

Three Rs for Garbage

The three Rs are **Reduce, Reuse and Recycle**—in that order.

Reduce (Precycle):

- Buy products with as little packaging as possible.
- Try not to buy disposables (razors, pens, diapers, etc.).
- Buy containers that can be recycled—glass, aluminum, tin, some plastic.
- At the store, don't accept a bag if you don't need one; bring your own bag when you shop.
- Don't buy Styrofoam—it usually can't be reused or recycled.

Reuse:

- Reuse whatever you can—paper and plastic bags, foil, the blank side of used paper.
- Use products that are made to be used many times—cloth napkins, towels and rags instead of paper towels; dishes and silverware instead of paper or plastic plates and utensils.
- Buy used toys and other things from second-hand shops or flea markets.

Recycle:

- Recycle aluminum, steel, glass, newspaper and cardboard.
- You may be able to recycle magazines, colored paper, wood, car oil and some plastics.
- Buy recycled products (look for a *recycled* sign on the label).

STUDENT

My Part in Managing Garbage

Directions: Answer the following questions.

1. What are *the three Rs* of managing garbage? Give two examples of each.

"R"	**Examples**
R _____	_____
	_____
R _____	_____
	_____
R _____	_____
	_____

2. What can you do to reduce the amount of garbage on our planet? Complete the following pledge once you have decided what you can do.

I promise that I will

_____

_____

_____

to help solve Planet Earth's garbage crisis.

Signed:

_____

_____

Date

STUDENT

School Garbage

Directions: With your team, investigate the amount of garbage in your assigned area of school at the end of one day. Complete this worksheet as a team. Answer the following questions about the garbage you found in your area.

Which area of school are you investigating?

How many cans did you find?

How many bottles did you find?

How many plastic containers?

How many Styrofoam products?

How much paper (about how many trash-bags full)?

How much food scraps (about how many trash-bags full)?

What other kinds of garbage did you find?

How much of it was there?

What do you think could be done at school to reduce the amount of garbage?

LESSON
4

CLEAN AIR, PLEASE

Objectives

Students will be able to describe sources of indoor and outdoor air pollution.

Students will be able to describe some health consequences of air pollution.

Students will be able to identify action steps to reduce or prevent indoor air pollution at home or at school.

Time

Two class periods.

Overview

This lesson uses cooperative learning groups to present information about the necessity of air for life and the sources and consequences of air pollution. A homework assignment asks students to survey their school or their home for sources of air pollution and to describe and consider taking action on one source of pollution.

Instructional Strategies

Class discussion, cooperative learning groups, creative expression, worksheets.

Teacher Materials and Preparation

HAVE:

- ✓ Tagboard or construction paper, one 8 1/2 x 11-inch piece for each student.
- ✓ Butcher paper, one large piece for each group of six students.
- ✓ Scissors.
- ✓ Glue or paste.
- ✓ Crayons or colored markers.

COPY:

- ✓ **Clean Air Puzzle Pieces** worksheet, one copy of each worksheet for each group of six students.
- ✓ **Clean Air Puzzle** worksheet, one for each student.
- ✓ **Indoor Air Pollution Survey** worksheet, one for each student.
- ✓ **My Part in Reducing Air Pollution** worksheet, one for each student.

REVIEW:

- ✓ **Clean Air Puzzle Pieces** worksheets for information about air pollution.

Procedure

■ Divide the class into groups of six, and have the members of each group count off from 1 to 6. Then give each student the **Clean Air Puzzle Pieces** worksheet that corresponds to his or her number. Tell students this is their piece of a jigsaw puzzle.

Depending on the reading level of your students, you may want to review some of the vocabulary on the information sheets. Then have students meet with the students from other groups who have the same number (or puzzle piece). Allow these new groups 15 minutes to read and discuss the information and decide how to present it to their original groups.

Meet with each group during this discussion; offer suggestions as

needed. (If students have not worked in cooperative learning groups before, this activity will take longer and will need more preparation.)

■ Have students return to their original groups and teach their information to this group. Distribute the **Clean Air Puzzle** worksheet. Tell groups to use the information from their puzzle pieces to answer the questions on the worksheet.

■ When groups have completed the **Clean Air Puzzle** worksheet, distribute tagboard or construction paper, butcher paper, scissors, glue or paste and crayons or markers to each group. Tell students to paste their puzzle pieces on the tagboard or construction paper and cut them out. Students in each group should then fit the puzzle pieces together on the butcher paper to complete the jigsaw puzzle.

Encourage students to decorate the puzzle pieces in a way that depicts what they've learned about air pollution and health. As time allows, have each group present its completed puzzle to the rest of the class with a brief description.

■ Prepare students to do a survey of the quality of indoor air at school. Alternatively, or in addition, students may do the survey at home. If students do the investigation at school, organize them in a way that will not disrupt the school. For example, assign different areas of the school to different teams.

Distribute the **Indoor Air Pollution Survey** and review it. Explain to students how to use the worksheet.

■ When surveys have been completed, go over the results. What did students find?

If students surveyed the school and have made commitments to do something about indoor air pollution, acknowledge their findings. If appropriate, coordinate student efforts to reduce pollution as a class project. If students did the survey at home, go over their findings.

Discuss ways to minimize or get rid of the pollution. Distribute the **My Part in Reducing Air Pollution** worksheet. Have students answer the questions and complete the pledge.

At the end of this unit, check back on student efforts to make changes.

■ *Optional:* Interested students may want to do a special project on Styrofoam. Styrofoam (polystyrene) harms the environment in many ways. Chlorofluorocarbons, which have been linked to the depletion of the earth's ozone layer, are used in the production of many products made with Styrofoam.

Styrofoam is permanent garbage; it will *never* decompose. Styrofoam is also a danger to sea animals because it looks like food in the water. Sea turtles sometimes eat Styrofoam and then can't dive again, because it makes them float.

Suggest that students plan a research-and-action project around Styrofoam. Students could survey the use of Styrofoam in the school cafeteria, fast-food restaurants, the grocery store or supermarket. Students should research the effects of Styrofoam and plan a strategy to convince these places to use alternatives like paper, cardboard or reusable materials.

Students may also want to write an article for the school newspaper about Styrofoam, or to post information on bulletin boards. They may want to suggest that students ask for fast-food meals wrapped in paper rather than in Styrofoam.

Remind students of the importance of individual action: if each student in the class pledges not to use Styrofoam, that will make a difference!

Evaluation

Assess students' ability to describe the causes and consequences of air pollution during their discussions in the cooperative learning activity. Evaluate students' responses on the **My Part in Reducing Air Pollution** worksheet for identification of action steps to help solve the problem at home and/or at school.

Follow-Up/ Extension

Have students create a campaign to reduce indoor air pollution at school. Take the results of student surveys to the principal and ask what can be done. Offer suggestions for change that the class has

brainstormed. Publicize the problems and proposed solutions in the school newspaper.

With the help of an adult, students can do an experiment about air pollution from automobiles. Get an old white sock, and put it over the tailpipe of a car. Get an adult to turn on the car and let it run for one minute. Turn the car off. Take the sock off the car and examine it. It will be full of pollution that is normally invisible to us.

Tell students that walking or riding a bike and encouraging others to walk or bike instead of driving a car can help reduce air pollution from cars.

STUDENT

Clean Air Puzzle Piece 1

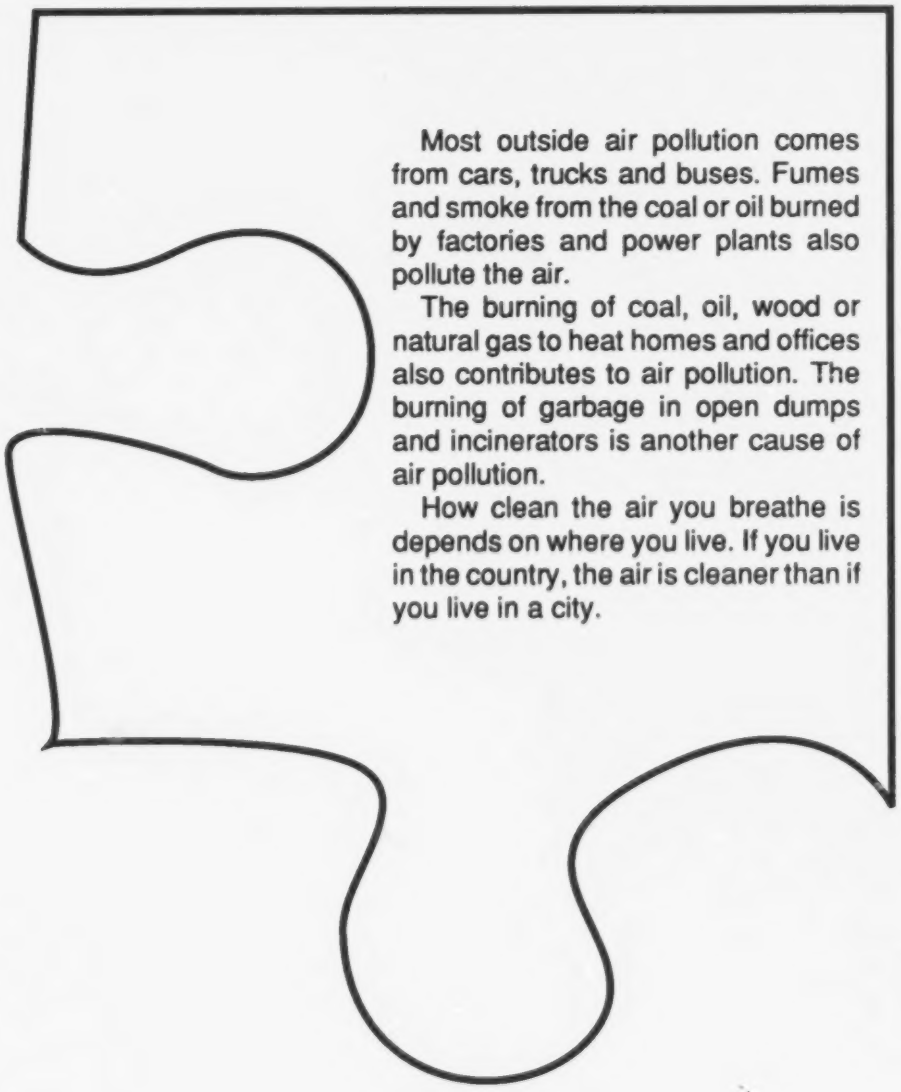
Most of us take air for granted. We forget that we depend upon air to live. Human beings breathe at least 12,000 quarts of air every 24 hours. Air provides all living things with the chemicals needed for life. Air is made up of 28 gases. Oxygen, nitrogen, carbon dioxide, hydrogen, ozone and neon are some of the gases in the air.

When we take a breath (inhale), air enters our bodies through the nose and mouth. Oxygen in the air is carried to the bloodstream. The air travels down the windpipe and through smaller branches of the windpipe called the bronchi and bronchioles. It finally reaches the tiny air sacs (alveoli) in our lungs.

When we breathe out (exhale), carbon dioxide passes back up through this respiratory system to exit through the mouth and nose.

STUDENT

Clean Air Puzzle Piece 2



Most outside air pollution comes from cars, trucks and buses. Fumes and smoke from the coal or oil burned by factories and power plants also pollute the air.

The burning of coal, oil, wood or natural gas to heat homes and offices also contributes to air pollution. The burning of garbage in open dumps and incinerators is another cause of air pollution.

How clean the air you breathe is depends on where you live. If you live in the country, the air is cleaner than if you live in a city.

STUDENT

Clean Air Puzzle Piece 3

The major source of indoor air pollution is cigarette smoke (or other tobacco smoke). Fumes from the products used to clean rugs, ovens, glass, toilets and tubs can also pollute indoor air. Cooking smoke is another source of indoor air pollution.

The best way to get rid of indoor air pollution is to get air moving. Open windows and doors, and let the inside air out and fresh air in.

Green houseplants can help reduce indoor air pollution. Products like baking soda, lemon juice and vinegar will do many cleaning jobs without polluting the air.

STUDENT

Clean Air Puzzle Piece 4

Most of us breathe about 25,000 times a day without even thinking about it. We need air to live. But can the air around us hurt us—or even kill us?

If there is a lot of pollution in the air we breathe, the pollution is absorbed into our bodies through our lungs and through our skin. Over time, breathing polluted air can cause diseases.

Asthma, bronchitis, emphysema, pneumonia and lung cancer are some of the diseases that are related to breathing polluted air. Air pollution can also cause heart and skin diseases, and allergies.

STUDENT

Clean Air Puzzle Piece 5

The air that surrounds us is part of the atmosphere that covers the entire earth. When one part of the planet is polluted, the pollution in the air spreads across the entire planet, carried by the wind.

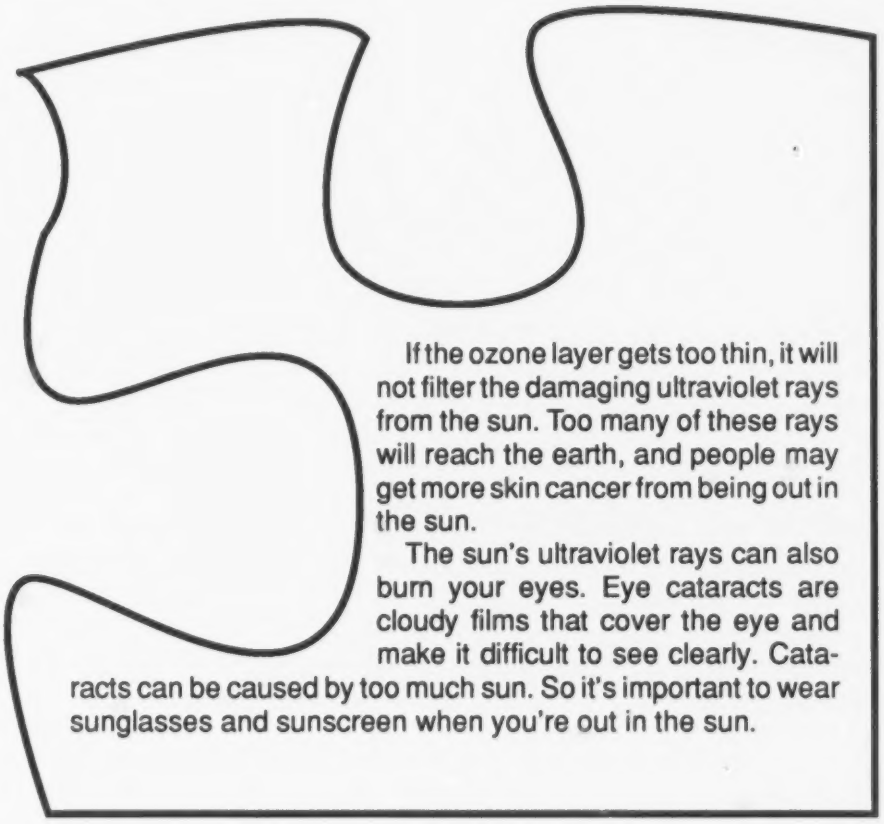
Polluted air is harming the ozone layer. This ozone layer is a band of ozone (a special form of oxygen) in the atmosphere, 6 to 30 miles above the earth's surface. This layer protects our planet from the sun's ultraviolet rays.

A hole was discovered in this ozone layer in 1985. Polluted air is thinning out this layer of protection. Scientists and politicians from all over the world are talking about what to do about this problem.

Chemicals called CFCs contribute to this thinning of the ozone layer. Many products made with Styrofoam use CFCs. One action you can take to help protect our planet is to stop using Styrofoam.

STUDENT

Clean Air Puzzle Piece 6



If the ozone layer gets too thin, it will not filter the damaging ultraviolet rays from the sun. Too many of these rays will reach the earth, and people may get more skin cancer from being out in the sun.

The sun's ultraviolet rays can also burn your eyes. Eye cataracts are cloudy films that cover the eye and make it difficult to see clearly. Cataracts can be caused by too much sun. So it's important to wear sunglasses and sunscreen when you're out in the sun.

STUDENT

Clean Air Puzzle

Directions: Put together the pieces of information the members of your group collected to answer the following questions.

1. What makes up the air?

2. How do we take air into our bodies?

3. What are some things in outside air that can be harmful to people and other living things?

4. How can we reduce outside air pollution?

5. What are some things in indoor air that can be harmful to people and other living things?

6. How can we reduce indoor air pollution?

7. What can happen to people who breathe polluted air?

8. How does air pollution affect our planet?

9. What is happening to the earth's ozone layer?

10. What are some health risks caused by changes in the ozone layer?

STUDENT

Indoor Air Pollution Survey

Directions: Use this form to investigate sources of indoor air pollution at school or in your home. Put a check next to the *Yes* if you find that kind of air pollution, or a check next to the *No* if you do not. Then total up the *Yes* and *No* answers at the bottom of the page.

Sources of air pollution		
1. Cigarette (or pipe or cigar) smoke	☐ Yes	☐ No
2. Unvented cooking smoke in kitchen/cafeteria	☐ Yes	☐ No
3. Car exhaust coming through windows from street or parking lot	☐ Yes	☐ No
4. Paint or other chemical fumes	☐ Yes	☐ No
5. Lack of fresh air circulation	☐ Yes	☐ No
6. Use of Styrofoam	☐ Yes	☐ No
7. Other sources? What are they?		
_____	☐ Yes	☐ No
_____	☐ Yes	☐ No
Total		

STUDENT

My Part in Reducing Air Pollution

Directions: Use the results of the **Indoor Air Pollution Survey** to answer the following questions.

1. Pick one of the sources of indoor air pollution, and describe what you could do to reduce that pollution.
2. Can you do this on your own or is it better to work with others?
3. Fill out the following pledge once you have decided what you can do.

I promise that I will

_____

_____

to help reduce indoor air pollution.

Signed:

_____

_____

Date

LESSON 5

SAVE THE RAIN FORESTS

Objectives

Students will be able to explain why rain forests are important to human beings around the world.

Students will be able to identify consequences of the destruction of rain forests.

Students will be able to identify personal actions to help save the rain forests.

Time

One class period.

Overview

This lesson expands student awareness of environmental issues from a community to a global level. This is done using the example of the destruction of rain forests.

A mini-lecture provides information about the special attributes of rain forests. Then students participate in a visualization exercise

about rain forests and draw or write about what they visualized. Students brainstorm ways to save the rain forests and identify personal actions they can take.

Instructional Strategies

Brainstorming, creative expression, teacher lecture, worksheets.

Teacher Materials and Preparation

HAVE:

✓ Overhead projector.
✓ Blank paper.
✓ Crayons or colored markers.

COPY:

✓ **Save the Rain Forests** worksheet, one for each student.
✓ **My Part in Saving Rain Forests** worksheet, one for each student.

MAKE:

✓ Transparency of **Rain Forests** teacher information sheet.

REVIEW:

✓ **Saving the Rain Forests *Teacher Background Information***.

Procedure

■ Tell students that other lessons in this module concentrated on environmental issues in their own community, like the importance of saving water and reducing garbage. Explain that water conservation and garbage are also important issues all over the world.

In this lesson, students will learn how another problem—the destruction of rain forests in other countries—has an effect not only on their community but on the entire world.

■ Ask students to think of words that describe a forest. Some words might be *trees, green, cool, damp, animals, insects, rivers* and *lakes*. Write these words on the board or on a transparency.

Then ask students what special sounds they might hear in a forest. Write the sounds on the board as well.

Ask students if they have ever been in a forest or if they've heard the term *rain forest.* What do they think a rain forest is?

Show students the **Rain Forests** transparency. Use Teacher Background Information as a guide to describe rain forests, answering the following questions:

- What are rain forests, and where are they found?
- What is their importance to human beings?
- What is their importance to our planet?

■ Tell students that they are now going to visualize what it might be like in a rain forest. Tell them that they must be very still and quiet and calm to participate. Ask them to get as comfortable as possible in their seats. You may want to dim the lights and suggest that students put their heads down on their desks to get comfortable.

Have students close their eyes and start to concentrate on relaxing. In a very calm voice, tell students to breathe slowly and try to clear thoughts from their minds. When the class seems calm and quiet, begin the visualization.

Tell students to imagine that they are in a rain forest. Use the following questions and statements to help them imagine being there. Pause long enough between each question or statement to allow students time to visualize and experience the rain forest in their minds.

- Imagine yourself walking into a rain forest.
- Think about how it feels. Do you feel the dampness on your skin?
- See yourself walk into the shade of the rain forest canopy. Look up to see if any light filters through the thick, green trees.
- Imagine yourself finding a beautiful flower, one you have never seen before. What color is it? How does it smell?
- Listen to the sounds of the rain forest. Can you hear running water? Can you hear insects? Can you hear birds? Take a moment to imagine sounds from other animals that may be in the rain forest.
- Imagine touching a plant in the rain forest. How do the leaves feel? How does the plant smell?
- Now imagine yourself slowly walking out of the rain forest. Get ready to come back to class.

Have students slowly sit up in their chairs and open their eyes. Ask for volunteers to share their experiences. Ask the following questions to encourage discussion:

- What color was the flower?
- What did it smell like?
- What did it look like?
- What sounds did you hear?
- What birds or other animals did you see or hear?

■ Now ask students to draw a picture or write a paragraph describing a rain forest. As time allows, ask for volunteers to share these rain forest images with the class.

■ Tell students that as important as rain forests are, they are rapidly vanishing. Research has indicated that as many as 40 to 50 million acres of rain forest are lost annually. Rain forests are being cleared to make way for agriculture and cattle ranching.

Note that fast-food restaurants in the United States are some of the major users of the beef produced on the cattle ranches in the rain forests. More than 120 million pounds of beef are exported from Central America to the United States every year.

Tell students that tropical wildlife and plants are also exported to the United States. Many tropical woods from rain forests, including teak, rosewood, mahogany and ebony, are used to make furniture in the United States and other developed countries.

■ Ask students to brainstorm some ways to slow down or stop the destruction of rain forests. Distribute the **Save the Rain Forests** worksheet. Tell students they can use these ideas to add to their list. Review each item, using ***Teacher Background Information*** as a guide.

One action that has short-term health benefits for human beings and long-term positive implications for rain forests is to stop or cut down on eating beef, especially in fast-food hamburgers. Discuss how reducing the amount of beef we eat would help save rain forests and why it would benefit our personal health.

■ Distribute the **My Part in Saving Rain Forests** worksheet. Tell students to answer the questions and complete the pledge.

Evaluation

Evaluate students' responses on the **My Part in Saving Rain Forests** worksheet to assess their understanding of the importance of rain forests and their ability to identify the consequences of rain forest destruction. Check student pledges for identification of personal actions that will help save the rain forests.

Follow-Up/ Extension

Show a film about rain forests. See the appendix for possible sources.

Encourage students to create a roleplay that deals with some of the complex reasons for cutting down rain forests and for saving them. Students could take the roles of president of a U.S. timber company, a farmer, an Indian who lives in the forest, a rancher, an ecologist and a medical researcher.

Each person should say why rain forests should be either cut down or preserved and defend that position. Students will need to prepare for their role by doing some background reading. See the appendix for suggested sources.

Have students design posters to educate other students in the school about the value of rain forests, and place the posters around the school.

Saving the Rain Forests

Teacher Background Information

What are rain forests, and where are they found?
Rain forests are lush tropical forests that receive at least 100 inches of rainfall annually. They are found in Central and South America, Africa and Asia. Although tropical forests cover less than 10 percent of the earth's land surface, they benefit billions of people worldwide and provide a home to many millions of species of birds, plants and other wildlife.

What is their importance to human beings?
Tropical rain forests are the earth's oldest continuous ecosystems. They are home to between 10 to 50 million species of plants and animals, half of earth's life forms.

Only about 1 percent of the tropical rain forest plants that have been identified have been scientifically analyzed, yet they are the source of more than one-quarter of the medical compounds used today. Seventy percent of the plants identified by the National Cancer Institute as useful in cancer treatment are found only in rain forests.

There are more than 1,000 rain forest tribes known to exist, who have lived in rain forests for centuries. Corn, rice and many other staple crops evolved in the tropics. Indigenous rain forest people eat hundreds of seeds, fruits and tubers unknown to the outside world; scientists know that some of these could be developed into new miracle crops.

Tropical forests also produce many foods such as coffee, nuts, honey, flavorings, spices, bananas and other fruits.

What is their importance to the earth?
Half of the species of plants and animals on earth depend on tropical forests. In one four-mile square of tropical forest in Brazil, you can find 750 kinds of trees; 1,400 flowering plants; 125 mammals; 400 birds; 100 reptiles and 60 amphibians.

Forests naturally absorb carbon dioxide, which is one of the major greenhouse gases responsible for global warming. (As global temperatures rise, we will face an increase in crop failure, oceans will rise and flood coastal areas, and many species of plants and animals will become extinct.)

Rain forests also absorb a large amount of fresh water, releasing it slowly and evenly. As rain forests disappear, soils become exposed to heavy rain, leading to flooding and erosion.

Why are rain forests disappearing?
Between 40 to 50 million acres of rain forests are lost annually. The biggest losses are occurring in Brazil, India, Indonesia, Burma and Costa Rica.

Almost the entire acreage of tropical rain forests lies within the borders of developing countries. Often the governments of these countries are encouraged to exploit the resources of their forests to pay off foreign loans. Population growth and inequitable distribution of land have further contributed to the problem.

The major reason for the destruction of rain forests is to make way for agriculture. In Central America, the primary motive is to have land for

cattle ranching. Most of the beef is produced for export to developed countries to be used by fast-food restaurants.

What can be done by individuals to save the rain forests?

If Americans reduced their meat intake by just 10 percent, the savings in grains and soybeans used to feed livestock could adequately feed 60 million people—the number of people who starve to death, worldwide, each year. This would also reduce the demand for beef, much of which comes from cattle raised on land that was once rain forest.

Don't buy tropical wildlife like parrots and macaws or tropical plants like orchids unless you can be sure they have been raised or grown in the United States and not taken from the wild. Don't buy furniture or products made with tropical woods—such as teak, rosewood, mahogany and ebony.

Communicate your views on saving tropical forests to others. Find out about agencies and banks that are helping tropical countries maintain a good economy without destroying the rain forests.

TEACHER

Rain Forests

What are rain forests?

- Lush, tropical forests
- Receive at least 100 inches of rainfall a year
- Found in Central America, South America, Africa and Asia
- Home for 10 to 50 million species of plants and animals
- Home for 1,000 tribes
- Crops include coffee, nuts, honey, spices and flavorings, bananas and other fruits

Why are they important?

- Home to half the earth's species of plants and animals
- Absorb carbon dioxide to reduce global warming
- Help regulate the earth's rainfall

STUDENT

Save the Rain Forests

Eat less meat.

If you buy tropical wildlife and plants (parrots, macaws, orchids), buy only those raised or grown in the United States.

Talk to your family and friends about the need to protect tropical woods—teak, rosewood, mahogany, ebony. Ask them *not* to buy furniture made from these woods.

Ask fast-food restaurants where their beef comes from. Eat at restaurants that don't import beef from tropical forests.

Join or support groups and organizations that are helping tropical countries. Ask them to sponsor activities that help save rain forests.

STUDENT

My Part in Saving Rain Forests

Directions: Answer the following questions.

1. List two reasons that rain forests are important to human beings.

2. What might be two consequences of destroying the rain forests?

3. What can you do to help save the rain forests? Fill out the following pledge once you have decided what you can do.

I promise I will

_____

_____

to help save the rain forests.

Signed:

_____

_____

Date

LESSON 6

PROTECTING OUR PLANET

Objective

Students will be able to identify ways they can help care for the environment.

Time

One class period.

Overview

This lesson focuses on individual commitment to an environmental ethic. Students are encouraged to integrate all the issues they have considered in previous lessons through the vehicle of their personal pledges.

They review these personal commitments and analyze their progress on a worksheet. Then they discuss this progress in small groups. Finally, students read a quotation and create a picture of a healthy planet.

Instructional Strategies

Class discussion, cooperative learning groups, creative expression.

Teacher Materials and Preparation

ASSIGN:

✓ Students to bring to class all four of their pledge worksheets (**My Part In...**) from previous lessons.

HAVE:

✓ Overhead projector.
✓ Blank paper.
✓ Crayons or colored markers.

COPY:

✓ **Progress in Planet Protection** worksheet, one for each student.
✓ **The Marvelous Ball** worksheet, one for each student.

MAKE:

✓ Transparency of **The Marvelous Ball**.

Procedure

■ Ask students to review the four pledges they made during the earlier lessons. Then hand out the **Progress in Planet Protection** worksheet. Tell students to use the information on their pledges to answer the questions on the worksheet.

■ Divide the class into small groups. Using their answers on the **Progress in Planet Protection** worksheet, have students share with each other some of the actions they promised to try. They should discuss what they have been able to do so far. Allow students to work with people with whom they feel comfortable sharing information.

Reconvene the class, and ask for volunteers to tell what was easy to do and what was harder to do. What might help students do the harder things? How did their families respond to what they tried to do at home? Ask students what changes they might make in their pledges based on their experience.

■ Distribute **The Marvelous Ball** worksheet, and show students a transparency of the worksheet. Read and discuss the quotation. Ask students to think about what the ball would look like. What could they do to help take care of and protect the ball?

Distribute paper and crayons or colored markers. Encourage students to draw their own pictures of this marvelous ball—Planet Earth. Ask for volunteers to share their pictures with the class.

■ Ask students if thinking about the earth as a small ball makes it easier to think of ways they can care for it. Acknowledge that sometimes the problems of our planet can seem so big that it's hard to see how one person can help. Emphasize the importance of individual efforts. Assure students that one person *can* make a difference.

If everyone does even one simple thing, the benefits for our planet can be tremendous. For example, if every student in your school alone conserved water, thousands of gallons of water a year would be saved. And if each student in the school convinced just one other person to save water, many thousands more gallons would be saved.

Encourage students to keep the pledges they've made during these lessons and review them occasionally. Tell students these pledges will remind them that what they do can make a difference for our planet and our health.

Evaluation

Review students' responses on the **Progress in Planet Protection** worksheet to assess their commitment to taking action in identifying ways they can help care for the environment.

STUDENT

Progress in Planet Protection

Directions: Take a look at the things you promised to do for your health and the health of your planet. How are you doing? Using the information on your pledges, answer the following questions:

1. Some things were easy to do. They were:

2. Some things were hard to do. They were:

3. I convinced my family and friends to help, too. (List what family and friends are now doing.)

4. I convinced my family and friends to help by telling them...(write what you said).

5. I think there is progress in planet protection because...

STUDENT

The Marvelous Ball

If Planet Earth
were only a few feet in diame-
ter, floating a few feet above a field
somewhere, people would come from every-
where to marvel at it. People would walk around
it, marveling at its big pools of water, its little pools and
the water flowing between the pools. People would
marvel at the bumps on it, and the holes in it, and they would
marvel at the very thin layer of gas surrounding it and the
water suspended in the gas. The people would marvel at all the
creatures walking around the surface of the ball, and at the
creatures in the water. The people would declare it precious
because it was the only one, and they would protect it so that
it would not be hurt. The ball would be the greatest wonder
known, and people would come to behold it, to be healed,
to gain knowledge, to know beauty and to wonder how
it could be. People would love it, and defend it with
their lives, because they would somehow know
that their lives, their own roundness, could
be nothing without it. If the earth
were only a few feet in
diameter.

Author Unknown

RESOURCES

Organizations

Alliance for Environmental Education, Inc.
Box 1040
3421 M St. NW
Washington, DC 20007

American Society for Environmental Education
P.O. Box 800
Hanover, NH 03755

The Environmental Defense Fund
257 Park Ave. South
New York, NY 10010

Environmental Protection Agency
401 M St. SW
Washington, DC 20460

Greenpeace
1436 U St. NW
Washington,DC 20009

National Audubon Society
950 Third Ave.
New York, NY 10022

National Wildlife Federation
1400 16th St. NW
Washington, DC 20036-2266

The Natural Resources Defense Council
40 West 20th St.
New York, NY 10011

The Nature Conservancy
1915 N. Lynn St.
Arlington, VA 22209

Office of Environmental Education
U.S. Department of Education
Washington, DC 20202

Rainforest Action Network
301 Broadway, Suite A
San Francisco, CA 94133

Renew America
1001 Connecticut Ave. NW,
Suite 1719
Washington, DC 20036

Sierra Club
730 Polk St.
San Francisco, CA 94109

World Wildlife Fund
1250 24th St. NW
Washington, DC 20037

Other Resources

50 Simple Things Kids Can Do to Save the Earth by The Earthworks Group. The Earthworks Press, 1400 Shattuck Ave., #25, Berkeley, CA 94709.

Listening to the Forest: An Action Guide by Susan Meeker-Lowry and Erik van Lennep. Catalyst, 64 Main St., Montpelier, VT 05602, (802) 223-7943.

"Our Threatened Heritage: Endangered Tropical Forests," a video-tape available from National Wildlife Federation, (800) 432-6564.

"Rainforest" (a National Geographic Video), available from Vestron Video, P.O. Box 4000, Stamford, CT 06907, and at video stores.

"The Vanishing Forest: The Crisis of Tropical Deforestation," a filmstrip and cassette available from Knowledge Unlimited, Inc., P.O. Box 52, Madison, WI 53701, (800) 356-2303.

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About the Author

Lisa K. Hunter, PhD, has extensive experience in research and development in the fields of education, health and mental health. She has developed print, video and film materials for educators and conducted national and statewide training for education, health and community-based groups since 1972.

She is the author of *Sources of Strength: Women and Culture*, a curriculum for secondary through adult students; *Friends Can Be Good Medicine: A K-12 Curriculum About Relationships and Well-Being* (with Donna Lloyd-Kolkin); *Oceans of Options: Sex Equity Lessons for the Classroom; The Process of Change: A Handbook for Teachers on the Process of Changing Sex Role Stereotypes* (with Gloria Golden and Greta Morine); and *The Comprehensive School Health Sourcebook* (with Donna Lloyd-Kolkin). She is a founding partner of Health & Communication Consultants, Menlo Park, Calif.

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Into Adolescence: Caring for Our Planet and Our Health

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ABOUT THE BOOK: *Into Adolescence: Caring for Our Planet and Our Health* increases students' awareness of the environment and its direct effect on their health. The six lessons in this curriculum for grades 5-8 focus on water conservation, waste management, air pollution and rain forest destruction. Lively activities keyed to the interests of adolescents are structured around these issues. The lessons stress the importance of individual action and encourage students to examine what they can do on both individual and group levels. *Caring for Our Planet and Our Health*:

- promotes personal commitment to environmental health
- emphasizes the importance of individual action
- explores the link between environmental issues and personal health
- challenges students to assess current environmental situations at school or at home

ABOUT THE SERIES: *The Contemporary Health Series* covers critical health and family life topics in a sequence of modules with two curricular divisions: INTO ADOLESCENCE for middle school teachers and ENTERING ADULTHOOD for high school teachers. Each of the modules in a division is compatible with the others but may stand alone. Other INTO ADOLESCENCE titles include: *Learning About AIDS*; *Living in a Family*; *Enhancing Self-Esteem*; *Learning About Reproduction and Birth*; *A Time of Change*; *Choosing Abstinence*; *Communicating Emotions*; *Avoiding Drugs*; *Making and Keeping Friends*; *Living Without Tobacco*; *Actions for Wellpower*; *Becoming a Health-Wise Consumer*; and *A Menu for Good Health.*

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